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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/743,840	12/22/2003	Paul Murphy	200917	9077

7590 03/22/2006

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EXAMINER

STAFIRA, MICHAEL PATRICK

ART UNIT PAPER NUMBER

2877

DATE MAILED: 03/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/743,840

Applicant(s)

MURPHY ET AL.

Examiner

Michael P. Stafira

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-20 and 32-36 is/are allowed.
- 6) ☒ Claim(s) 21 and 22 is/are rejected.
- 7) ☒ Claim(s) 23-31 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 May 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Claim Objections

1. Claim 9 is objected to because of the following informalities: In claim 9, the claim limitations need to end in a ".". Appropriate correction is required.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

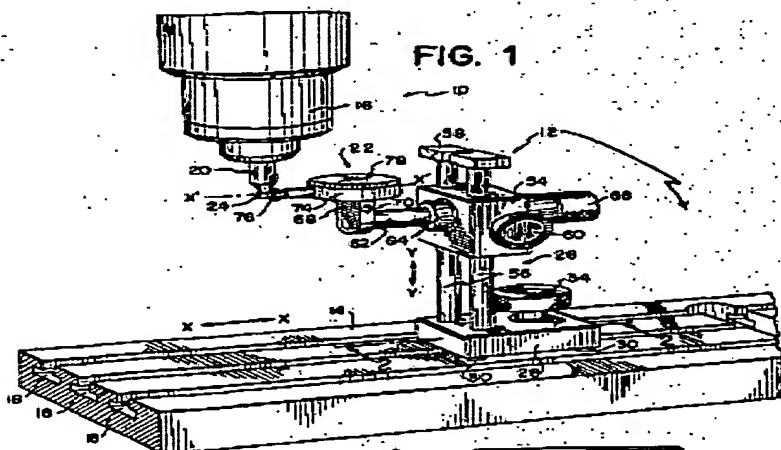
A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 21-22 are rejected under 35 U.S.C. 102(b) as being anticipated by D'Aniello ('011).

Claim 21

D'Aniello ('011) discloses mounting a test part (Fig. 1, Ref. 21, 24) on the rotational axis (Fig. 1, Ref. 16), and obtaining gauge measurements (Fig. 1, Ref. 22) of the surface of the test part at a plurality of positions of the rotational axis (See Abstract).



Claim 22

The reference of D'Aniello ('011) further discloses the step of obtaining gauge measurements of the surface of the test part at a plurality of positions along the translational axis (See Abstract).

Allowable Subject Matter

3. Claims 1-20, 32-36 are allowed over the prior art of record.
4. Claims 23-31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

5. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 1, the prior art fails to disclose or make obvious a metrology system including a part-positioning means having a spindle axis and a wavefront-measuring gauge, a part-on-mount method for determining the position of a test part with respect to the spindle axis, and of the spindle axis with respect to the wavefront-measuring gauge having the steps of extracting tilt components from said surface measurements at each of said rotary positions; fitting a circle to said tilt components and said rotary positions; and determining the center and radius coordinates of said circle to provide gauge-to-spindle and spindle-to-part misalignments, respectively, and in combination with the other recited limitations of claim 1. Claims 2-8 are allowed by the virtue of dependency on the allowed claim 1.

Regarding claim 9, the prior art fails to disclose or make obvious a metrology system including a part-positioning means having a spindle axis and a wavefront-measuring gauge, a

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part-on-mount method for determining the position of a test part with respect to the spindle axis, assuming a particular gauge-to-spindle misalignment values having the steps of extracting tilt components from said surface measurement; and d) subtracting said assumed gauge-to-spindle misalignment values from said tilt components to provide an estimate of the spindle-to-part misalignments, and in combination with the other recited limitations of claim 9.

Regarding claim 10, the prior art fails to disclose or make obvious a method for employing an embedded gauge and test surface to determine geometrical constants of a mechanical positioning system including X, Y, and Z translational axes and A, B, and C rotational axes, wherein such constants may include lateral scale of the translational axes, spatial separations between the rotary axes, and axial position of a gauge focus with respect to a machine stage having the steps of setting the positions of said rotary axes to zero; moving said stage along at least one of said X and Y axes such that said A axis passes through the focus of said gauge; adjusting said translational axes such that said test surface is confocal with said embedded gauge; moving a one of said rotary axes to a new value; repositioning said test part at said confocal position by adjusting said translational axes; recording the positions of axes that achieve said confocal condition; repeating steps for several different positions of said rotary axes; and performing a numerical fit to an analytical model of said machine geometry, and in combination with the other recited limitations of claim 10.

Regarding claim 11, the prior art fails to disclose or make obvious a method for aligning a wavefront-measuring gauge to a mechanical positioning system having a spindle axis having the steps of using said gauge to measure angular misalignment between said spindle (A) axis and said gauge; and e) re-orienting said gauge mainframe with respect to said mechanical positioning

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system, based on said angular misalignment measurement, to align said mainframe with said spindle axis, and in combination with the other recited limitations of claim 11. Claim 12 is allowed by the virtue of dependency on the allowed claim 11.

Regarding claim 13, the prior art fails to disclose or make obvious a method for calibrating and aligning a metrology system including a multi-axis mechanical positioning system and an embedded wavefront-measuring gauge to determine accurately the spatial relationships among the translational and rotational axes of the system having the steps of aligning said embedded gauge onto said A rotational axis; determining spatial offsets between said rotational axes when so aligned; and precisely aligning said machine rotational axes with said respective translational axes to set precise zero points for said rotational axes, and in combination with the other recited limitations of claim 13. Claims 14-19 are allowed by the virtue of dependency on the allowed claim 13.

Regarding claim 20, the prior art fails to disclose or make obvious a metrology system including a multi-axis positioning machine and an embedded wavefront-measuring gauge in collimated mode, a method for determining the image position of a machine spindle axis in the gauge coordinate system having the steps of extracting x-y coordinates in the gauge coordinate system from said measurements at each spindle position; d) fitting a circle to said x-y positions; and e) determining the center and radius coordinates of said circle to provide both the position of the spindle image in the embedded gauge coordinate system and the part-to-spindle decentration misalignment, respectively, and in combination with the other recited limitations of claim 20.

Regarding claim 32, the prior art fails to disclose or make obvious a method for aligning an interferometer aperture converter to a mechanical positioning system having a spindle axis

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having the steps of placing a corner cube having a measurable front surface on the spindle; using the interferometer to measure angular misalignment between the spindle axis and the interferometer with aperture converter attached; and re-orienting the aperture converter with respect to the interferometer mainframe, based on the angular misalignment measurement, to align the aperture converter on the interferometer mainframe with the spindle axis, and in combination with the other recited limitations of claim 32. Claim 33 is allowed by the virtue of dependency on the allowed claim 32.

Regarding claim 34, the prior art fails to disclose or make obvious a method for aligning an interferometer aperture converter to a mechanical positioning system having a spindle axis having the steps of placing a corner cube having a measurable front surface on the spindle; using the interferometer to measure angular misalignment between the spindle axis and interferometer with aperture converter attached; and re-orienting the aperture converter with respect to the interferometer mainframe, based on the angular misalignment measurement, to align the aperture converter on the interferometer mainframe with the spindle axis, and in combination with the other recited limitations of claim 34. Claim 35 is allowed by the virtue of dependency on the allowed claim 34.

Regarding claim 36, the prior art fails to disclose or make obvious a method for aligning a transmission sphere to an interferometer with partial coherence having the steps of introducing misalignment interference fringes with a distinct center, such as would be observed by moving the test part along the axis of the interferometer; changing the focus position of the interferometer as necessary to observe a modulation envelope over the interference fringes; and

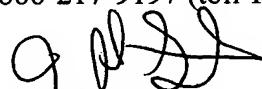
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adjusting the tip/tilt of the transmission sphere to make the modulation envelope pattern and the fringe pattern concentric, and in combination with the other recited limitations of claim 36.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael P. Stafira whose telephone number is 571-272-2430. The examiner can normally be reached on 4/10 Schedule Mon.-Thurs..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Toatley can be reached on 571-272-2800 ext. 77. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Michael P. Stafira
Primary Examiner
Art Unit 2877

March 14, 2006